Science

L.E.A.D. Academy Trust
Lead • Empower • Achieve • Drive

Theme/ Concept	KS2	Year 7	Year 8	Year 9	Year 10	Year 11	Post-16
Biology ***The cellular basis of life***		**What is life?** Animal & plant cell structure Microscopy Specialised animal & plant cells Introduction to stem cells Organisation & unicellular organisms Diffusion Osmosis	**Respiration** Aerobic and anaerobic respiration Word equations Fermentation	**Cells & cell transport** Prokaryotic & eukaryotic cells Specialised cells Microscopes & magnification Osmosis Diffusion Active Transport	**Cell division** Further cell structure Chromosomes The cell cycle Mitosis Stem cells **Bioenergetics** Photosynthesis & limiting factors Using glucose from photosynthesis Aerobic & anaerobic Respiration Metabolism	*(Application)*	*Biological molecules* *Cells* *Organisms exchange substances with their environment*
Biology ***DNA as the molecule of inheritance***	*Animals including humans* *Evolution & Inheritance*	***(Cells)***	**Reproduction** Human reproductive systems Sexual and asexual reproduction Fertilisation Pregnancy and birth Effects of substance misuse in pregnancy The menstrual cycle Contraception	***(Cells & cell transport)***	**Inheritance** Sexual & asexual reproduction meiosis Genetic inheritance Genotype & phenotype Inherited disorders Sex determination Variation Understanding of genetics DNA and the genome **GCSE Biology** *Advantages & disadvantages of sexual & asexual reproduction* *DNA structure* *Protein synthesis*	**Variation & evolution** Selective breeding Evolution & natural selection Evidence for evolution Antibiotic resistance Genetic engineering Cloning Fossils Classification **GCSE Biology** Cloning Theory of evolution Speciation The understanding of genetics	*Genetic information, variation* *Genetics* *The control of gene expression*

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Biology ***Human Biology***	*Animals including humans* *Evolution & Inheritance*	**Health & fitness** Biomechanics - skeleton, muscles & movement Nervous system Simple endocrine systems Substance misuse - Alcohol - Smoking - Vaping - Nitrous oxide - Drugs	**Breathing & Circulation** The Lungs Inhalation/exhalation Diffusion Asthma & smoking Lung disease The heart - basics **Food & digestion** Digestive system Simple enzymes Bacteria in the digestive system Diet Energy calculation Malnutrition	**The digestive system** Human digestive system Food tests Digestive enzymes **The heart & circulation** Blood The heart Blood & blood vessels Health issues Non-communicable diseases Heart disease The lungs	**Defense and immunity** Pathogens & microbes Communicable diseases Human defense systems Discovery and development of drugs Reducing the spread of infection Vaccination **GCSE Biology** *Monoclonal antibodies & their uses* *Plant diseases & plant defense response*	**Homeostasis & response** Human nervous system Human endocrine system Control of blood glucose **GCSE Biology** *Maintaining water & nitrogen balance* *The Brain* *The Eye* *Control of body temperature* *Plant hormones & uses of plant hormones*	*Organisms exchange substances with their environment* *Energy transfers* *Organism response to environment*

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Biology ***Ecosystems***	*Living things and their habitats*	**Ecology** Habitats & communities Variation Continuous & discontinuous variation Biodiversity Biotic and abiotic factors Adaptation & variation Charles Darwin Gene banks Natural selection Sampling	**Plant biology** Plant organisation Leaf structure & adaptations (basic) Photosynthesis word equation Plant as energy stores Structure of the flower Reproduction in plants seed dispersal The carbon cycle	**Plant organisation** Leaf structure Stomata Transport in plants (transpiration and translocation)	**Adaptations & competition** Interdependence biotic & abiotic factors Sampling Adaptations & competition Extremophiles Feeding relationships **GCSE Biology** *Trophic levels* *Interdependence* *Pyramids of biomass* *Transfer of biomass* *Pollution* *Nutrient cycles* *Food security* *Food production* *Decomposition* *The impact of environmental change*	**Human effects on ecosystems** Biodiversity Deforestation & peat bogs The carbon cycle The water cycle Global warming	*Relationships between organisms* *Energy transfers* *Populations, evolution and ecosystems*

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Chemistry ***Structure, Properties, Bonding & Analysis***		**Elements, mixtures and compounds** Particulate nature of matter Elements, compounds Symbols & formulae Mixtures Introduction to the Periodic Table	***(Chemical reactions)***	**Atomic structure** Atomic structure Subatomic particles Charge Size & mass Relative atomic mass Isotopes Electronic structure Balancing equations	**Bonding** Chemical bonds Ionic bonding Properties of ionic compounds Covalent bonding Properties of small molecules Giant covalent structures Structure and bonding of carbon Comparison to ionic bonding Metallic bonding Properties of metals and alloys incl conductors Polymers. **GCSE Chemistry** *Bulk & surface properties inc. nanoparticles*	**Organic chemistry** Hydrocarbon molecules Cracking Fractional distillation **GCSE Chemistry** *Reactions of organic compounds* *Synthetic & naturally occurring polymers*	*Atomic structure, amount of substance, bonding*
	Rocks	***(Elements, mixtures and compounds)***	**Separation techniques** Pure & impure substances Solutions, Concentration & dilution Chromatography Filtering & evaporation Simple distillation	**Periodic Table** Elements Metals & non-metals Atomic structure & periodic patterns History of the Periodic Table Group 0 Group 1 Group 7 **GCSE Chemistry** *Properties of transition metals*	**Electrolysis** Electrolysis of molten compounds & solutions Balanced equations Extracting aluminum Chemical analysis Purity Formulations Chromatography Identification of common gases **GCSE Chemistry** *Identification of ions by chemical and spectroscopic means*	***(Application)***	*Energetics, kinetics, thermodynamics, rate equations, acids & bases, periodicity*

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Chemistry ***Chemical Reactions***	*Properties and changes of materials*	**Chemical reactions** Reactants & products Conservation of mass Representing reactions using: Word equations Symbol equations (simple balanced) Combustion, thermal decomposition & displacement Endothermic & exothermic reactions Catalysts	**Materials and acids** Composites, ceramics and polymers Acids & alkalis pH scales Neutralisation Reactions of acids including: making a salt Testing for hydrogen and carbon dioxide Representing reactions using word equations	**Energy changes** Exothermic & endothermic Reaction profiles incl use of catalysts Energy change of reactions Chemical cells & fuel cells **Reactions with acid** Strong and weak acids Concentration of solutions & pH Neutralisation Acid metal reactions Filtration & evaporation Oxidation & reduction Redox	**Electrolysis** Relative atomic and relative formula mass Balancing equations Moles Moles in gases & moles in solution Amounts of substances in equations Using moles to balance equations Limiting reactions **GCSE Chemistry** *Yield & atom economy* *Titration* *Amount of gases*	**Rates** Rate of reaction Collision frequency Reversible reactions Catalysis Reversible reactions Dynamic equilibrium **GCSE Chemistry** *Haber process*	*Redox, chemical equilibria*
Chemistry ***Earth & Resources***		**Earth & recycling** Rocks & the Earth Earthquakes & waves Atmosphere, air quality & pollution inc. acid rain and greenhouse gases Chemical & physical weathering Recycling	***(Chemical reactions)***	**Extracting metals** Reactivity Extraction of metals Extracting metals from low grade ore	***(Organic chemistry)***	**Atmosphere & resources** Composition and evolution of the Earth's atmosphere Greenhouse effect and climate change Making rocks Making fossil fuels Atmospheric pollution Using resources and potable water Water cycle Recycling **GCSE Chemistry** *NPK fertilisers* *Alloys / Corrosion* *Glass, ceramic, polymer, composites.*	*Organic chemistry*

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Physics ***Energy***	*Light* *Straight lines* *Reflection to see objects* *Shadows*	**Energy** Energy stores Energy transfers Heat transfer by particles Heat transfer by radiation Energy from food Work done Power	***(Energy)***	**Energy calculations** Energy stores & systems Conservation of energy Work done Gravitational potential Kinetic Elastic potential Efficiency Power	**Nuclear Radiation / atomic structure** History of the atom Atoms & isotopes Radioactive decay Nuclear radiation Half-life Hazards & uses of radioactive emissions & background radiation **GCSE Physics** *Nuclear fission & fusion*	***(Application)***	*Waves* *Thermal* *Radioactivity*
		(Energy)	**Waves - Sound** Transverse & longitudinal Properties of waves superposition Sound waves Sound and the oscilloscope The ear Hearing damage Echo and ultrasound Microphone and speaker **Waves - Light** Light sources Light and surfaces How we see The law of reflection Refraction Lenses and the eye Camera obscura Light and colour	***(Energy transfer)***	**Waves** Transverse & longitudinal Properties of waves Wave speed calculations Ripple tank Speed of sound Reflection and diffuse vs specular waves and surfaces (reflected, transmitted absorbed and transparent, translucent and opaque)	**Electromagnetic spectrum** Communications (radio, microwave and optic fibre) Leslie cube UV, X-rays and gamma **GCSE Physics** *Sound waves* *Waves for scanning* *Light colour and filters* *Refraction* *Reflection Refraction RP* *Lenses*	*Waves* *Thermal* *Radioactivity*

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Physics ***Energy***	*Electricity* *Brightness & voltage* *Components* *Symbols*	**Resources** Structure of the earth Earthquakes Fuels and power stations Renewable and non-renewable The cost of electricity	**Electricity & Magnetism** Static electricity and fields Potential difference, current and resistance Series circuits Parallel circuits Magnets Magnetic fields Electromagnets Using electromagnets	**Energy resources** Comparing conventional power stations Wind and wave energy Tidal and hydro electric Solar Geothermal and data analysis Big energy issues (meeting changing demand) **Electricity in circuits** Current and charge Ohms law Resistance in a wire Series circuits Parallel circuits Resistors in series and parallel Component graphs Components Charge and energy **GCSE Physics** *Static electricity*	**Domestic electricity** AC and DC Plugs and cables Fuses Power calculations The national grid	**Electromagnetism** Magnetic fields Fields and current The motor effect **GCSE Physics** *Electromagnetic devices* *Generator effect* *Alternator and dynamo* *Transformers* *Transformer calculations*	*Electricity* *Electric & Magnetic Fields*

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Physics ***Forces***	*Forces* *Gravity* *Types of force* *Transferring force*	**Forces** Introduction to forces Squashing and stretching Drag forces Friction Balanced forces Unbalanced forces Speed Fields Weight, mass and Gravity	***(Energy)***	***(Forces)***	**Forces in balance** Vectors and scalars Forces between objects Balanced and unbalanced forces Centre of mass Parallelogram of forces Resolving Forces Newtons laws **GCSE Physics** Moments and gears **Forces in balance** Force and Motion Force and acceleration Weight and terminal velocity Forces and braking Momentum Force and elasticity **GCSE Physics** *Conservation of momentum* *Impact forces*	**Force and pressure** **GCSE Physics** *Pressure and surfaces* *Pressure in a liquid* *Atmospheric pressure* *Upthrust and floating*	*Mechanics*

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Physics ***Forces***	*Earth & Space* *Solar System* *Moon* *Day & Night*	***(Forces)***	**Space** The night sky Stars and galaxies The universe The solar system Gravity and orbit (simple) Days, months, years, and seasons The light year Changing ideas	***(Energy)***	**Motion** Distance time graphs Velocity time Graphs More complex graphs of motion	**Space** **GCSE Physics** *Solar system & the universe* *Stellar evolution* *The Big Bang Theory* *Red shift* *The cosmic microwave background* *Orbits*	*Circular and SHM* *Gravitational Fields*
Physics ***Matter***	*Properties of Materials* *Classify* *Dissolving* *States of matter*	**Particle Model** Changes of state and particle model melting and freezing Boiling and evaporation Brownian motion and diffusion Gas Pressure	***(Energy)***	**Energy transfer by heating** Heating Conduction Specific heat capacity Latent heat Insulation Changing ideas	**Molecules & matter** Density Density RP States of matter Internal energy Heating and cooling Specific latent heat Gas pressure **GCSE Physics** *Gas pressure and volume*	***(Application)***	*Particle Physics* *Materials*

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Science skill 1 ***Calculations***		Identifying variables and their units Three variable formulae Choosing formulae Application of formulae Using percentages Calculating mean	Rearrangement of formulae Application of rearranged formulae Standard form Simple prefixes - kilo, milli	Four and five variable formulae Prefixes and conversion Significant figures Identifying ratios Calculating percentages Calculating volume	Calculating units Combining formulae Deriving formulae Measuring and calculating angles Using ratios	Calculation to problem solve	*Arithmetic and numerical computation* *Handling data* *Algebra* *Geometry and trigonometry*
Science skill 2 ***Scientific communication***	*Reporting and presenting findings from enquiries* *Identifying scientific evidence* *Oral and written forms*	Understanding scientific terminology Using scientific terminology verbally Producing simple verbal explanation	Using scientific terminology in writing Organising thought to produce logical verbal explanation	Organising thought to produce logical written explanation	Using evidence to justify ideas Refining written work to increase precision	Writing detailed scientific analysis and evaluation	
Science skill 3 ***Practical skills***	*Planning different types of scientific enquiries* *Taking measurements* *Recording data and results*	Identifying risks Developing simple hypotheses Following a method Identifying basic apparatus and instruments Basic sampling Recording data	Preventing risks Identifying more apparatus and instruments Generating hypotheses Organising and recording data	Basic risk assessment Devising a method Identifying a broad range of apparatus and instruments	Evaluating risks Planning an experiment Choosing most appropriate apparatus and instruments	Developing and implementing full experimental techniques Manipulating sampling techniques Evaluation and suggesting improvements Identifying limitations of experimental data	*Use of apparatus and techniques* *Use and application of scientific methods and practices* *Instruments and equipment*

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Science skill 4 ***Graph and analysis***	*Using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs*	Bar charts Simple line graphs Plotting data accurately	Pie charts Deciding axis scale	Calculating gradient	Tangent to a curve Area under a graph	Comparing trends and patterns	*Handling data* *Graphs*
Science skill 5 ***Working scientifically***	*Asking questions, analysing functions, relationships and interactions*	Using models Considering ethical, environmental and economic issues	Appreciating limitations of models Understanding how theories develop over time	Generating models Presenting observations appropriately	Evaluating ethical, environmental and economic issues Appreciation of peer review	Interpreting observations, patterns and trends	*Independent thinking*

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Scientific Discipline ***Scientific Method***	*Making predictions*	Stem cell research History of the atom Mendeleev Periodic Table Classifying materials Gravity, mass & weight The particle model of matter	Measuring breathing & heart rate Food security & the effect of pollution The lungs & the heart Carbon cycle Rocks & the Earth Recycling and life cycle assessment Model of the solar system Waves for exploration	Discovery of DNA Definition of kingdoms & domains Giant covalent structures & their use Collision theory Metallic bonding & conductors	Stem cell research Monoclonal antibodies Genetic engineering Cloning Vaccination Discovery & development of drugs Discovery of penicillin Electrolysis Nuclear radiation Use of fission & fusion Orbits & satellites	Selective breeding Theory of evolution Classification Food security The Haber Process National Grid	*Accuracy, precision, repeatability, reproducibility* *Scientific methods and development of theories* *Evaluating risk*
Scientific Discipline ***Apparatus & Techniques***	*Planning scientific enquiry* *Taking measurements*	Using microscopes Making solutions Separating mixtures Acids, alkalis and pH scales Simple titrations Measuring energy changes Measuring elasticity Measuring volume	Leaf structure Physical & chemical changes and separation Endothermic and exothermic reactions Measuring forces Taking electrical measurements	Measuring osmosis Measuring purity Chromatography Identification of common gases Identification of ions & spectroscopy Measuring rate of reaction Electric circuits Sensing circuits Measuring motion Hooke's Law	Action of enzymes Sampling methods Electrolysis Cracking Fractional distillation Potable water Reflection & refraction of waves Lenses	Eye dissection Limiting factors of photosynthesis Making NPK fertiliser Making electric motors	*Developing questions* *Making predictions* *Scientific enquiry* *Technique, apparatus & materials* *Making and recording observations* *Sampling techniques*

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Scientific Discipline ***Data Analysis***	*Recording data* *Reporting*	Identifying cell features Continuous & discontinuous variation Calculating neutralisation Calculating density Drawing graphs of force-extension Calculating density	Measuring diffusion Conservation of mass Balanced chemical equations Percentage yield Analysing graphs of motion	Control of blood glucose Food webs Pyramids of biomass Sampling techniques Rate of reaction Efficiency Measuring motion	Genetic inheritance statistics Variation Disease statistics Relative atomic & relative formula mass Balancing equations Composition of the atmosphere Calculating half-life	Measuring body temperature Quantitative chemistry Calculating step-up & step-down transformers	*Interpreting observations & data* *Presenting reasoned explanations* *Evaluating data* *Identifying error*
Scientific Discipline ***Using Evidence***	*Identifying scientific evidence*	Development of health ideas over time Fossil evidence for evolution Rutherford scattering Electronic structure Structure of the Earth Newton's First Law Brownian Motion	Life cycles Mitosis Properties of elements and ionic compounds Big Bang Theory - Red shift and CMBR	Specialisation of exchange surfaces Deficiency, obesity and malnutrition Catalysis Reactivity Black body radiation Static electricity Newton's Laws Hooke's Law	Genetic inheritance Antibiotic resistance Reducing the spread of infection Composition and evolution of the atmosphere Fossil fuels Hazards & uses of nuclear radiation Orbits in solar system	Evidence for evolution & fossils Extinction Biodiversity Environmental science Origins of the universe The Big Bang Theory Stellar evolution	*Development of theories over time taking account of new evidence*

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Maths for Science		Sampling groups Chemical nomenclature for elements, compounds & mixtures Simple chemical formulae SI units for energy, force, speed & mass Application and manipulation of equations Drawing straight line graphs	Statistics and graphing breathing rate and heart rate Analysis stats related to smoking Calculating rate of photosynthesis Electronic configuration Conservation of mass calculations Balancing chemical equations Calculating percentage yield Calculating energy changes Graphing endothermic & exothermic reactions Statistics on composition of the atmosphere Wave calculations Electricity calculations (current, p.d., resistance) Motion calculations (distance, displacement, speed, velocity) Pressure calculations	Interpreting statistics Pyramids of biomass Calculations relating to bonding Formulations Calculating rate of reaction Calculating energy changes Calculating power & efficiency Electricity calculations (Power, energy, efficiency) Motion calculations (acceleration, power, momentum) Presenting Hooke's Law graphically Calculating elastic energy store Calculating work done	Statistics relating to food production Statistics relating to genetic inheritance Half equations Relative atomic & relative formula mass Balancing equations Yield & atom economy Composition of the atmosphere Nuclear decay equations Graphing half-life Calculating moments Vector nature of circular motion	Graphing body temperature Graphing limiting factors Moles Amounts of substances in equations Using moles to balance equations Concentration of solutions & pH Titration Stoichiometry Calculating p.d. in relation to transformers	*Mathematical calculation* *Presenting data* *SI units* *Chemical nomenclature* *Equations* *Calculations* *Statistical techniques*